of some astronomers watching Mars split into two, then into four, and finally into about 500 bits. This cluster then proceeds to swallow Jupiter and Saturn; the sun blows up, and the earth starts off somewhere on a wild career, with a piece of sun just big enough to keep it fairly warm. Then two of our astronomers suffer a magical shrinkage in size, entering the infratonic (less than electronic) world. And here we may as well leave them, for Nature is a scientific journal, and this book, though a romance of science, is more of the former than the latter.

J. A. H.

NEW BOOKS ON CHEMISTRY.

(1) *Per-acids and their Salts.* By Dr. T. Slater Price. Pp. vi + 123. (London: Longmans, Green and Co., 1912.) Price 3*s.* net.

(2) *Researches on Cellulose.* III. (1905–1910). By Cross and Bevan (C. F. Cross and E. J. Bevan). Pp. x + 173. (London: Longmans, Green and Co., 1912.) Price 7*s.* 6*d.* net.

(3) *Modern Research in Organic Chemistry.* By F. G. Pope. Pp. xii + 324. (London: Methuen and Co., Ltd., n.d.) Price 7*s.* 6*d.*

(4) *A Second Year Course of Organic Chemistry for Technical Institutes.* The Carbocyclic Compounds. By F. B. Thole. Pp. vii + 186. (London: Methuen and Co., Ltd., n.d.) Price 2*s.* 6*d.*

(5) *Experimental Science.* II., Chemistry. By S. E. Brown. Pp. vii + 140. (Cambridge University Press, 1912.) Price 2*s.*

(6) *First Year's Course of Chemistry.* By James Sinclair and George W. M'Allister. Pp. vii + 165. (London: G. Bell and Sons, Ltd., 1912.) Price 1*s.* 6*d.*

(7) *Elementary Quantitative Analysis.* By Dr. William Briggs and H. W. Bausor. Pp. viii + 122. (London: W. B. Clive, University Tutorial Press, Ltd., 1912.) Price 2*s.*

(8) *Chemical Theory and Calculations.* An Elementary Text-book. By Dr. F. J. Wilson and Dr. I. M. Heilbron. Pp. iv + 138 (London: Constable and Co., Ltd., 1912.) Price 2*s.* 6*d.* net.

(1) DR. PRICE'S monograph on the per-acids and their salts is the second volume of a series of monographs on inorganic and physical chemistry, the previous volume (Mr. Soddy's book on the chemistry of the radio-elements) having been reviewed recently in these columns. One half of the book is occupied with an account of the persulphuric acids and persulphates, the remainder of the volume dealing with perborates, percarbonates, pernitric and perphosphoric acids; pertitanates, perzirconates and perstannates; pervanadates, percolumbates, and pertantalates; perchromates; permolybdates, pertungstates and peruranates. The new volume will go far to establish the reputation of the series for thoroughness and utility. More than three hundred references are given to the literature of a subject which would scarcely have been credited by the ordinary readers with having provided material for one-half this number of papers.

A word of comment may be added in reference to the author's criticism of the view that in presence of concentrated sulphuric acid, the per-oxidised material consists mainly of pertetra-sulphuric acid, $H_2S_4O_{14}$. Such solutions on dilution undoubtedly yield an oxidised acid of the formula H_2SO_5. But the appearance of this acid is quite compatible with its formation by hydrolysis on the dilution of a solution containing the higher acid, as shown by the equation

$$H_2S_4O_{14} + 3H_2O = 3H_2SO_4 + H_2SO_5;$$

such a hydrolysis would not disturb the ratios of "persulphuric oxygen" to "peroxide oxygen," on which the formula $H_2S_4O_{14}$ was based. The hydrolysis of Marshall's acid to Caro's acid, as shown by the equation

$$H_2S_2O_8 + H_2O = H_2SO_5 + H_2SO_4,$$

by dissolving it in concentrated sulphuric acid and then diluting, presents some analogy to the conversion of ethylene into alcohol by a similar process; in each case the initial process may very well be a condensation of the hydrolyte with the acid to form a more complex substance, which is then easily hydrolysed on dilution.

(2) The third volume of Messrs. Cross and Bevan's "Researches on Cellulose" covers the five years from 1905 to 1910, but has been delayed to include research work published in 1911. Special interest attaches to the final chapter on technical developments, in which a brief account is given of some important modern cellulose industries. It is noted that in the artificial silk industry the last five years have been marked by rapid developments, accompanied by a rapid gravitation to the level of competitive prices. This has arrested the development of the collodion processes, and has accentuated the struggle between the cuprammonium and viscose processes, in reference both to relative costs and to the textile qualities of the products. A remarkable development consists in the production of transparent films of viscose in lengths of 1000 to 10,000 metres at an average width of a metre, and at a thickness of 0·25 down to 0·01 mm. In view of the fact that the process involves (1) coagulation, (2) purification from sulphur, (3) bleaching and purification by special washings,

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and (4) drying, and, moreover, that the shrinkage in width may amount to 30 to 40 per cent., this accomplishment is little short of marvellous. It is accomplished by a single machine, but this has a length of 50 to 60 metres. The material can be coloured and embossed in a very effective way, as is shown by a series of seven samples enclosed with the volume. Experiments are also described on cellulose acetate, which serves, amongst other purposes, as an excellent material for insulating the wire of galvanometers and other instruments in which its extreme thinness gives it a marked advantage.

(3) Mr. Pope's book on modern research in organic chemistry is one of those useful summaries of research work that have formed a conspicuous feature of recent publications. The subjects selected are the polymethylenes, terpenes and camphors, the uric acid group, the alkaloids, colour and constitution, salt-formation, pseudo-acids and bases, the pyrones, ketenes, ozonides and triphenylmethyl and the Grignard reaction. The work has been well and thoroughly done, and full bibliographies are given. The book will therefore be of considerable service both to honours students and to teachers who are not able to acquire complete series of the journals in which original papers are published, but will be glad to place this book upon their shelves.

(4) The "Second Year Course of Organic Chemistry" deals with the carbocyclic compounds, and does not differ very widely in its treatment from other books of a similar type. Some of its most valuable features are found in the appendices, which contain a scheme for qualitative organic analysis and tables of physical constants, suitable for use in identifying organic compounds.

(5) This little book covers a course of elementary chemistry which should be completed in two years by a class working two hours a week. It is based upon the report presented at the Newcastle-upon-Tyne meeting of the British Association by the committee formed to investigate the methods of teaching chemistry. The author claims to have been one of the first to put the suggestions of that committee to a complete practical test in the laboratory. He has found it advantageous to short-circuit the heuristic method in its strictly historical form, and thus finds a proof of the presence of oxygen in lime by direct combustion of metallic calcium. In one respect he has broken away from a hoary tradition, and in reconstructing Lavoisier's decomposition of the oxide of mercury has provided a spirit-lamp as a source of heat in place of the Bunsen burner usually introduced into the picture. It is unfortunate that he should have introduced the terms monoxide and dioxide before the significance of these terms can be explained; as a matter of historical treatment the anachronism may be pardoned in a book that does not profess to teach history, but there would be a great logical advantage in using in place of "carbon dioxide" one of the earlier names, "fixed air," "carbonic acid gas," or "carbonic anhydride."

(6) The "First Year's Course of Chemistry" is arranged in such a way that the experimental work of each lesson occupies the earlier part of each chapter, and is followed by a discussion of the results of the experiments. This system, which has been adopted in at least one other class-book of chemistry, possesses obvious advantages in actual practice, as it agrees with the system followed in the laboratory. The course is intended to occupy a single session, with an allowance of three or four hours per week on the time-table, and covers much the same ground as the volume noted in the preceding paragraph, the direct combustion of calcium being used here also to prove the nature of lime.

(7) The Tutorial "Elementary Quantitative Analysis" describes the simplest forms of gravimetric and volumetric analysis. A conspicuous feature of the book is the introduction of a large number of problems as variants on the usual direct analyses. These resemble closely the problems set in recent examinations, and will doubtless serve to brace the student to face the ordeal of a practical test in quantitative analysis.

(8) The text-book on chemical theory and calculations is primarily intended to provide a series of numerical examples of the different types of calculations that are likely to occur in a course of chemistry. The text is confined almost entirely to stating the theories and describing the apparatus involved in the problems, but some half-dozen chapters have been included which deal with subjects, such as the periodic classification of the elements, which do not lend themselves to numerical exercises.

T. M. L.

OUR BOOKSHELF.

Handbook of the Technique of the Teat and Capillary Glass Tube, and its Applications in Medicine and Bacteriology. By Sir A. E. Wright, F.R.S. Pp. xvi+202. (London: Constable and Co., Ltd., 1912.) Price 10*s*. 6*d*. net.

IN this book Sir Almroth Wright gives a full account of the ingenious apparatus and methods which he and his co-workers have evolved for making quantitative estimations, principally in connection with the blood and other body fluids. It is generally not possible in this kind of work to deal with quantities greater than a small fraction of a cubic centimetre, and therefore ordinary graduated pipettes and measures are not applicable. It is true that graduated pipettes to deal

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